

ECOLOGIC INVESTIGATIONS OF THE RELATIONSHIP BETWEEN ILLNESS, LIFE EXPERIENCES AND THE SOCIAL ENVIRONMENT*

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By the beginning of the present decade there was enough clinical and experimental evidence to establish the fact that a man's reactions to the situations that he encounters in his daily life may affect a great number of his internal processes. In effect, it was clear that any bodily function subject to the regulation of the central nervous system might be influenced to a significant degree, and that the regulatory influences of the central nervous system might be mediated directly by way of the neural pathways or internal secretions, or indirectly by way of changes in the over-all behavior of the individual. The effects of these, taken together, might lead to notable variations in general activity, energy expenditure, food and fluid intake, sleep patterns and the like, and to important changes in the specific demands made upon various organ systems, especially when such systems are involuntarily involved in reaction patterns not directly appropriate to the adaptation which the organism is attempting to make. In short, there was a sound theoretic and experimental basis to support the very old clinical observation that disease may wax and wane according to the moods and fortunes of the patient.

On the other hand, the extent to which such adaptive reactions are involved in disease in general, and the degree to which they determine the health of the individual, remained to be established. It was in an attempt to answer some of the questions in this area that the studies of the relation between human health and human ecology which formed the basis for this report were undertaken. Up to the present time, those engaged in these studies have investigated the illness patterns of more than 3,000 people drawn from the ambulatory population. The subjects fall into five population groups (table 1), each relatively homogeneous in certain important respects, and each selected because it presented an opportunity for answering questions pertinent to the over-all investigation.

The two American working groups, for example, were of great value

* Presented at the Thirty-ninth Annual Session of The American College of Physicians, Atlantic City, New Jersey, April 30, 1958.

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These studies were supported by grants from The Society for The Investigation of Human Ecology, and from The U. S. Public Health Service Grant M-1531 (C1).

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because of their long-term, unbroken, comprehensive records of health, attendance, and performance at work. They were also remarkably homogeneous with respect to many characteristics of their members and the environment in which they had lived. Most of these American workers had spent their young adult lives in a social milieu that did not undergo dramatic change. Among these people, therefore, individual life experiences were a prominent variable. The Chinese, by contrast, were people who had spent their lives in a milieu that was undergoing dramatic social and cultural

TABLE 1
The People Studied

1. 1,700 semiskilled American working women.
2. 1,527 skilled American working men.
3. 100 Chinese graduate students and professional people.
4. 76 Hungarian refugees.
5. 132 recent graduates of American colleges.

change, and their individual experiences included a variety of geographic, political and economic dislocations, as well as difficulties arising from interpersonal relations. This group allowed one to study the effects of notable changes in the milieu of individuals of an ethnic and cultural background different from our own. The American college graduates and the Hungarian refugees were people with still different sets of characteristics and experiences, throwing light on a number of other points of interest.

These studies have been carried out through the collaborative efforts of investigators from the medical, biologic and social sciences. Data relating

TABLE 2
Methods

Data on health were derived from:

1. Analysis of comprehensive medical records, covering repeated observations over periods as long as 25 years.
2. Analysis of comprehensive attendance and personnel records covering similar periods.
3. Reports of private physicians and hospitals.
4. Detailed medical histories (by internists).
5. Direct observations of health patterns.
6. Physical examinations.
7. Laboratory diagnostic procedures.
8. Psychiatric interviews.
9. Psychologic tests.

to health have been derived from a number of sources, and much effort has been expended in an attempt to assure that they reflect as accurately as possible the health patterns of the people who were studied (table 2). The findings have been consistent, regardless of the method used, and information derived from one source has been confirmed by that derived independently from other sources. Data relating to the physical and psychologic characteristics of the individual, his social, cultural and familial background, his development and his life experiences were obtained by the extensive and independent efforts of investigators from several of the disci-

TABLE 3

Methods

Data on background, life experiences and social environment were derived from:

1. Family histories
 2. Detailed biographies
 3. Interviews with cultural anthropologist
 4. Interviews with sociologist
 5. Interviews with psychiatrist
 6. Psychologic tests (Rorschach, Wechsler-Bellevue, thematic apperception, projective questionnaire, sentence completion, and others).
 7. Reports of family, associates and employers.
 8. Observations of behavior.
- } By internists, psychiatrists, and sociologists
} two to four hours each

DISTRIBUTION OF EPISODES BY QUARTILES

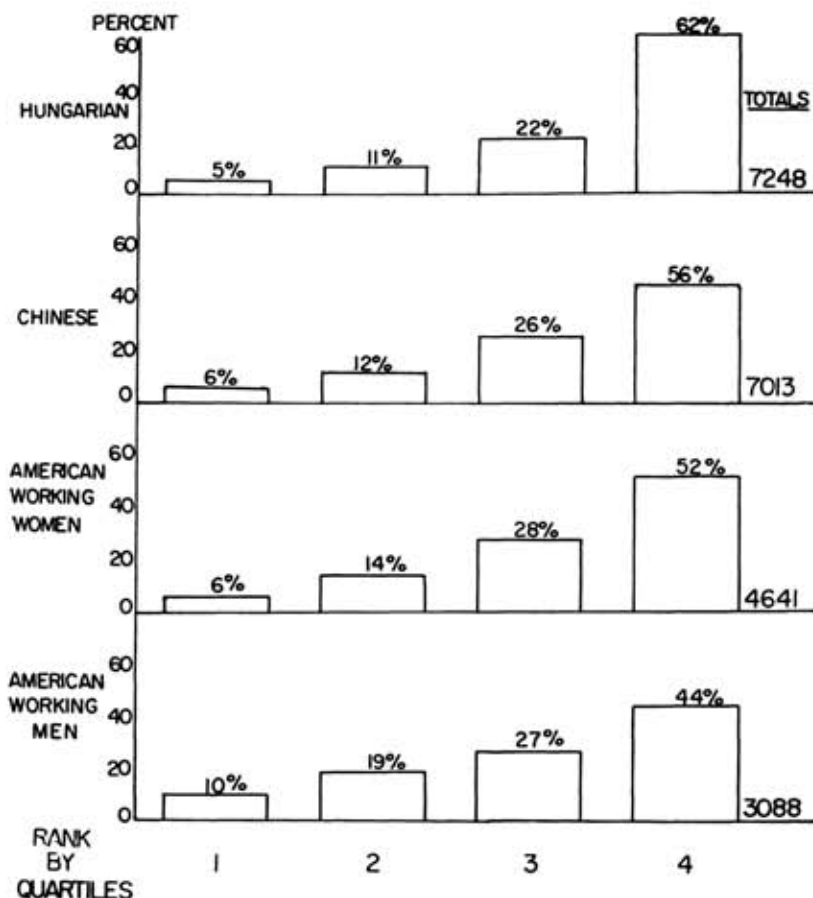


FIG. 1. In each population group, 25% of the individuals experienced approximately 50% of all episodes of illness that occurred among members during a 20-year period of young adult life. Another 25% of the individuals experienced less than 10% of the episodes.

plines, involving many hours of study of those informants who were selected for intensive investigation (table 3). These data likewise are consistent from one source to another and, in some instances, are buttressed by pre-existing records.

Episodes of illness were not distributed at random among the members of any of these groups.¹ In each group, during two decades of young adult life, one fourth of the individuals had experienced approximately one-half of all of the episodes of illness that had occurred among all of the people.



FIG. 2. Differences in general susceptibility to illness. As the number of episodes of illness experienced by the individual increases, the number of organ systems involved in disease increases also. Example drawn from the intensive study of 20-year health histories of 96 young adult American working women. Similar results were obtained from the studies of other groups.

The distributions were such that they can be explained only by assuming that some factor in addition to chance operates to determine them.² In other words, the members of each group behaved as if there were differences in their susceptibility to illness (figure 1).

These differences in susceptibility to illness were not simply the result of differences in susceptibility to one or another specific syndrome. In every group the members displayed a difference in their susceptibility to illness in general, regardless of its type, or of the causal agents apparently involved. Thus, as the number of episodes of illness experienced by an individual increased, the number of different types of disease syndromes that he exhibited

increased also. Although a great many of these syndromes might involve one or two organ systems, episodes of illness were not limited to a few systems; instead, as the number of episodes of illness experienced by an individual increased, the number of his organ systems involved in disease increased also (figure 2). Likewise, as the number of episodes he experienced increased, he exhibited illnesses of an increasing variety of etiologies (figure 3). He was likely to have more "major," irreversible and life-endangering illnesses, as well as more "minor," reversible and transient ill-



FIG. 3. Differences in general susceptibility to illness. As the number of episodes of illness experienced increases, the individual exhibits illnesses of an increasing number of etiologies. Example drawn from the study of American working women. Similar results were obtained from the studies of other groups.

nesses. Finally, as the number of his "bodily" illnesses increased, the number of his "emotional disturbances" and "psychoneurotic" and psychotic manifestations (here categorized as "disturbances of mood, thought and behavior") usually increased also.

These findings have been obtained consistently in each of these five groups, regardless of the sex, race, culture, economic or social background, environment or life experiences of the people studied. They are most reasonably explained by assuming that they are dependent upon factors operating within the individual, influencing the ease, the frequency and the degree to which he responds to the great variety of other factors known to be capable

of causing disease. The relative constancy of individual illness patterns in the two groups of American working people² lends support to this hypothesis (figure 4), and, incidentally, indicates that the illness patterns of these people were relatively little influenced by the therapeutic efforts of the physicians who treated them.

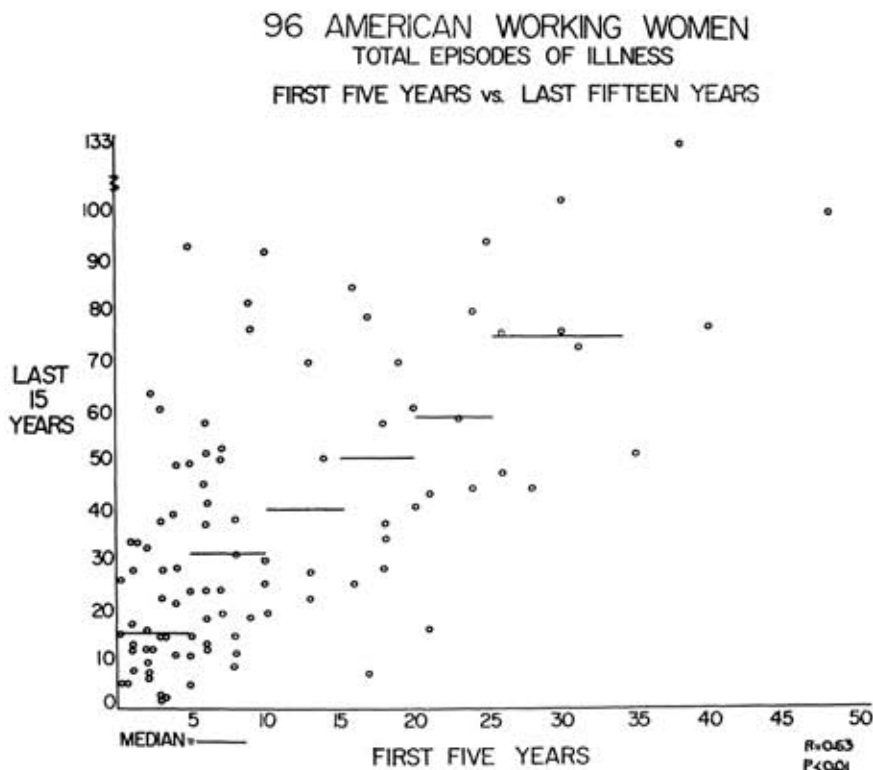


FIG. 4. The illness episode rate of an individual during the last 15 years of observation tends to be like his rate during the first five years. Example drawn from the study of American working women. Similar results were obtained from the studies of other groups.

If one examines the illness patterns of men and women over many years of their adult lives, one finds that each person has a rather consistent mean rate of illness episodes, around which his annual rate fluctuates. However, from time to time there occur peak periods, usually of several years' duration, during which the episode rate may be much higher (figure 5). We have called such peak periods "clusters" of illness episodes. If one arbitrarily defines a "cluster year" as a year during which the episode rate for disabling illnesses is 1.75 or more times as great as the mean rate for the individual over the entire observation period, one finds that, in those people who show the phenomenon of "clustering," about one eighth of the years are "cluster years," and that about one third of each person's illnesses occur during such

years (figure 6). This mathematical device does not, however, completely define the phenomenon of clustering. As may be seen in figure 5, each "cluster year" is often surrounded by other years when the rate is almost as high, and illness episodes altogether have a more distinct tendency to group themselves during limited periods of years than the simple figures indicate. These periods occur at no fixed time of life, and have no fixed duration. In the American groups, "clusters" were more frequent but relatively small and of short duration, and the individual was not likely to deviate greatly

AMERICAN WORKING WOMEN "CLUSTERING" OF ILLNESS

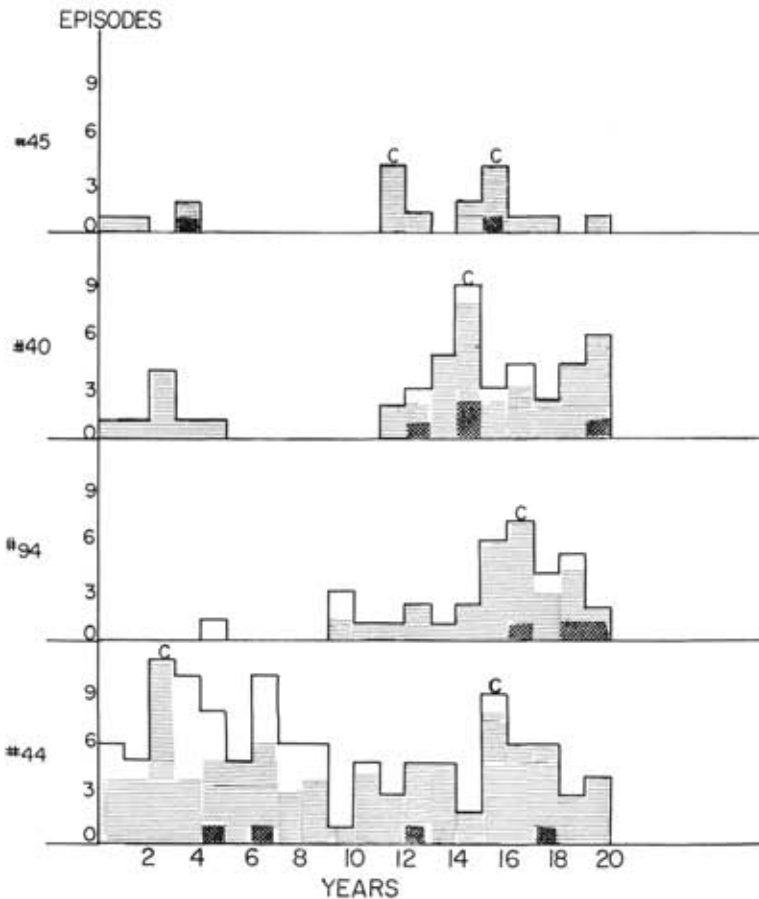


FIG. 5. Twenty-year health patterns of four women, drawn at random from the American group. Black squares are "major" disabling illnesses. Crosshatched squares are "minor" disabling illnesses. Open squares are "minor" illnesses not causing disability but serious enough to require medical attention.

The illness rate of woman No. 45 tends to be low; that of No. 44 tends to be high. "Clusters" of illness occur in the adult life of each woman. "Cluster years" are marked "C" (see text). "Clusters" are determined on the basis of disabling illnesses.

from his mean episode rate. This was reflected in the constancy of illness patterns among the members of these groups, which we have just discussed. Among the Chinese and Hungarians, clusters were less frequent but often were of much greater magnitude and duration, and individual illness patterns were somewhat less predictable over a 20-year period.

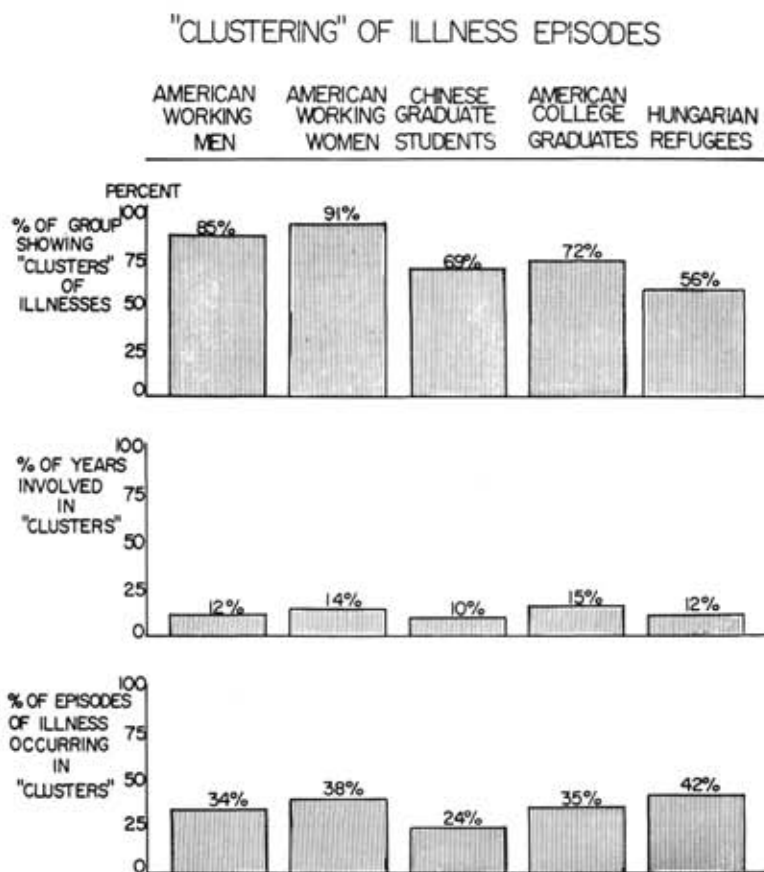


FIG. 6. The occurrence of the clustering phenomenon in the five population groups. From 56% to 91% of the individuals in each group exhibit this phenomenon. Illnesses were distributed over the adult lives of these people in a manner such that slightly more than one third of all episodes of illness occurred in approximately one eighth of the years.

Examination of these "clusters" of illness episodes reveals that they are not usually made up of a single syndrome which recurs over a period of time; nor do they usually consist of a "major" illness and other illnesses which are commonly thought of as its complications or sequelae. These phenomena, of course, do occur and do account for a significant proportion of the clustering phenomenon. But the usual cluster is made up of several different and ostensibly unrelated syndromes of different degrees of severity, often arising from several etiologic sources that have no evident relation

to each other. This finding also is consistent among the members of every group that has been studied. The individuals in every group behave as if there are periods in their lives during which their susceptibility to illness in general is increased. These periods occur at no special time of adult life, and have no specific duration or magnitude—they occur as if they were the result of something which might happen to an individual at any time during his adult life, and which might last for any length of time.

Coincident with the studies of the illness patterns of these people, the investigation of their environments and life experiences was carried out.^{3,4} The data were recorded independently of those relating to illness. Detailed, chronologically arranged biographic descriptions of each person were obtained, outlining as comprehensively as possible the total milieu in which he operated during each period of his life. Due attention was given to such factors as occupation, activity, sleep, rest, diet, and exposure to infection, trauma and toxic materials, as well as to the people, events and social environment which he encountered, and his reaction to these. The limitations on these data are those which limit any painstaking, detailed, historical data obtained independently by a number of skilled investigators, working with intelligent and coöperative subjects. In some instances the data were obtained in a "double-blind" fashion—neither the history taker nor the subject knew the final purpose for which they were being sought. In nearly all instances the subjects were unaware of the purpose of this aspect of the history taking. In the two American working groups, records and direct observations were available for some of the subjects. The whole body of data is consistent throughout the five groups. The findings of observers of different disciplines, working independently, support each other, as do records and direct observations where these are available.

It was evident that some clusters of illness were the result of phenomena well known to influence human susceptibility to illness. Thus a Chinese who, during the period from 1937 to 1942, fled from Peking to a provincial town in a malarious area of southwest China might develop recurrent bouts of malaria, recurrent diarrhea (including a severe episode of illness with the clinical characteristics of cholera), malnutrition, and active tuberculosis. Later, upon his return to his home in the city, his health might improve greatly. Similarly, a Hungarian, seized by the AVH in 1949 and imprisoned until 1952, beaten, underfed, overworked, and exposed to the elements during this time, might have had several bouts of pneumonia, severe dental caries, and a disease with the clinical characteristics of rheumatic fever, during his imprisonment. An American working man who became alcoholic might develop cirrhosis, malnutrition and esophageal varices, and have a number of accidents. Such stories were not unexpected, and occasioned no surprise; but phenomena such as these accounted for only a small proportion of the clusters of illness that were observed in any group. It was much more common to observe that peak periods of illness occurred in

the absence of any significant change in activity, diet, or exposure to infection, trauma, toxic materials or other physical aspects of the environment (figure 7).

The great majority of the clusters of illness episodes that occurred in the lives of the members of every group occurred at times when they perceived their life situations to be unsatisfying, threatening, overdemanding,

AMERICAN WORKING MAN

RELATION BETWEEN LIFE SITUATIONS AND CLUSTERS OF ILLNESS

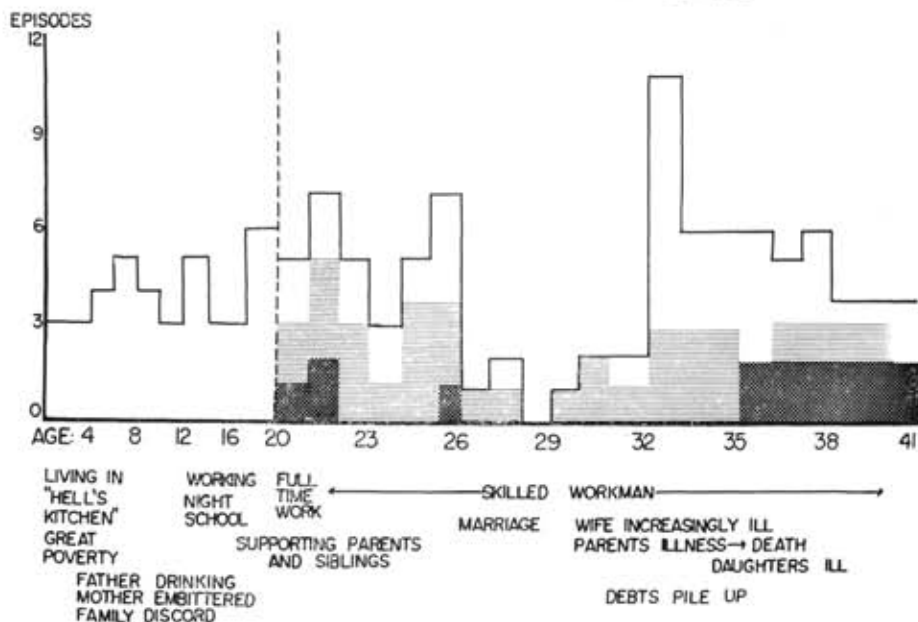


FIG. 7. An example taken from the study of American working men. Two peak periods of illness occurred during this man's adult life. The first, from age 20 to 26, included two episodes of lobar pneumonia, acute appendicitis, thrombophlebitis, two inguinal hernias, mumps, many minor respiratory infections, recurrent lower bowel symptoms ("irritable colon" syndrome), and severe dental caries. The second cluster, extending from age 32 to 41, included coronary artery disease with angina pectoris, a moderately severe agitated depression, and the recurrence of the respiratory infections and of lower bowel symptoms.

These two clusters were temporally associated with changes in the informant's life situation. As a young man he worked his way out of a difficult home environment to attain a secure economic position, and occupational and marital satisfaction, by the age of 26. Deterioration of his life situation, brought about by illness of his wife, two daughters and parents, was associated with a marked recrudescence of illness.

and productive of conflict, and they could make no satisfactory adaptation to these situations. The situations were, in general, those which arose out of disturbed relations with family members and important associates, threats to security and status, and restrictions and limitations which made it impossible to satisfy important needs and drives.

The documentation of this observation requires some preliminary ex-

planation. Whereas man interacts with some aspects of his physical environment through direct energy interchanges, and by the ingestion or absorption of various substances, he interacts with his "social" and "interpersonal" environment in a manner quite different. With few exceptions, this aspect of his environment does not impinge upon him at all. He interacts with it by means of a communication system, picking up "signals" from it, largely by means of his eyes and ears, and reacting to these signals upon the basis of what they mean to him. Thus a man reacts to his life situation not necessarily as an outside observer evaluates this situation, but as he himself perceives it.

The relevant variable with regard to man's reaction to his social environment and life experiences, therefore, is not the "actual" environment and the "actual" experiences themselves, but the subject's perceptions of these. The term "perceive," as here used, is taken to mean all of those processes that go on within an individual which involve the receiving and evaluation of information. Many of these processes take place quite outside of his awareness. In the present state of our understanding, one is far from being able to define all of the factors which will determine how a given individual will perceive and react to a given situation. However, the broad general categories into which these determinants will fall are readily defined. A man's perception of his life situation must be a function of his genetic or "constitutional" endowment, plus his acquired characteristics: his cultural and social background, the sum total of the effects of all of his past life experiences, and the information available to him about the situation in which he is involved. This is not the same thing as defining what his perception of his life situation will be, but it does indicate the general areas in which data must be sought if one is to make an estimate of this perception. Such considerations governed the design of the data-gathering efforts in these studies.

There being no "objective" measure of the way that a man perceives his environment, one must depend upon the best estimates of trained observers, who attempt to synthesize the information available from all of the areas that have just been mentioned. Although cumbersome, the procedure is less difficult than one might imagine. It requires no great sophistication to estimate that an ambitious Hungarian economist, ousted from his job for political reasons, forced to perform maddeningly dull work as a clerk, under surveillance by the AVH, his children deprived of their right to an education, and his wife forced to work as a chambermaid, perceives his life situation as unsatisfactory, even though his diet is adequate, his occupation is not hazardous, and he is no more exposed to infection, trauma or toxic materials than when he taught at the University. The same may be said of a 35 year old American housewife whose husband develops a chronic illness, and who finds herself forced to keep a house, to raise and care for two small children, and to nurse an ill husband, while working full time at

a job in order to support them all. Observers generally agree in their estimates of the subjects' perceptions of such situations. Given the large body of data available about each subject, even less dramatic situations, and those which on first glance appear to be less clear-cut, are not a great deal more difficult to estimate.

In one study, carried out in our laboratories by Dr. W. N. Christenson, the following procedure was utilized: from all of the data on 68 subjects, all of the information relating to health and illness was removed. This was given to a medical statistician who received no other information about the subjects. Using a prearranged, standardized procedure used in all of these studies, she calculated the annual illness episode rates for each subject, and placed the episodes in their proper categories. All of the remaining data on each subject, representing the findings of the anthropologist, sociologist, psychiatrist and psychologist, the reports of associates and other observers, the biographic statements, and those portions of the medical data not describing illness (reports of nonmedical experiences, occupations, activities, etc.), were transcribed in toto. All of this information was given to three new observers, who knew nothing of the illness episode rates, or of other details of the medical history. Each of these three, working independently with all of the information, was asked to score the subject's perception of his life situation and his ability to make an adequate adaptation to it, on a five-point scale from "highly satisfactory" to "highly unsatisfactory."⁵

Altogether, 1,234 years of the lives of these 68 subjects were scored by the three. The number of possible combinations of choices was over 150,000. The ratings of the three observers coincided with each other to a degree far beyond chance ("P" is very small and approaches zero for this degree of coincidence). This provided confidence that the three observers were making their estimates upon a similar basis, and that this was related to the data provided to them.

After the estimates were received, the mean of the three for each year was taken. It was plotted against the independently derived episode rate of the individual for that year. From this it was determined that the illness episode rates of all of these people were significantly higher during those years when the observers estimated that they had perceived their total life situations as unsatisfactory, and that they could make no adequate adaptation. Statistical tests of significance indicate that this finding is reliable well beyond the 1% level of probability.

Other findings, from other aspects of the studies, support the observations just described. They indicate also that those who have the highest illness episode rates, and who show the highest susceptibility to illness in general, are those who perceive their total environment to be most unsatisfactory, and who experience the greatest difficulty in adapting to it; and this feature, likewise, seems to be independent of sex, age, race, and cultural or social background.⁶

COMMENT AND CONCLUSION

When one brings together the information derived from this considerable number of people, of such diverse background and experience, one can scarcely escape the conclusion that, whoever a man may be, and whatever may happen to him, the way that he perceives his life situation and reacts to it is an important determinant of his health. It is a reasonable estimate that at least one third of all the illness episodes that occurred among these people were influenced in their time of occurrence, or in their course, by the attempts of the individual to adapt to the events and situations that he encountered. This estimate is based upon the occurrence of "clusters" of episodes and their demonstrated relation to life experiences. Probably one should add to this the evidence that people with a consistently high illness rate experienced a majority of all of the episodes that occurred among the group, because such consistently high rates of illness are at least in part based upon a continuing inability of the individual to make an adequate adaptation to his milieu. When this additional point is considered, it becomes likely that efforts to adapt to the social environment are to some degree involved in the majority of all of the illness episodes that occur among the adult population.

That the state of the host is one of the determinants of the occurrence of illness is, of course, axiomatic in medicine. The observation that exposure, overactivity, extreme fatigue and other periods of physiologic disturbance may facilitate the occurrence of disease, or adversely affect its course, is as old as recorded medical lore. However, it is perhaps not generally appreciated that the state of the host is an important determinant of so large a proportion of illness episodes, and that a man's susceptibility to illness during adult life is to such a large degree influenced by his relation to the society in which he lives and the people in it. Yet this is not unreasonable. It has been pointed out that in the course of adaptive reactions any bodily function subject to the regulation of the central nervous system might be influenced to a significant degree and that the regulatory influence of the central nervous system might be mediated directly by way of any of the nervous pathways or internal secretions, or indirectly through changes in the over-all behavior of the individual. This physiologic arrangement quite clearly carries with it the possibility that any disease process may be influenced to some extent; and the observations indicate that this does, in fact, happen. There seem to be no categories of illness that are immune to physiologic influences of this sort, and there is no theoretic reason why there should be. Evidently all illness is to some extent affected by the way that men perceive their life situations and react to them.

Obviously, some illnesses are influenced in this manner much more readily and to a much greater degree than others. Illnesses so easily influenced are well known, and some of them, such as peptic ulcer and asthma, have

been called "psychosomatic." But these studies yielded no evidence to support the idea that there is any special category of diseases which should be designated by this term. So far as these data are concerned, there need be no qualitative difference between peptic ulcer, typhoid fever, carcinoma of the breast and gout in the way that these diseases are related to the patient's general adaptation. Whatever difference is present appears to be only quantitative, in that peptic ulcer appears to be more readily, more frequently and to a greater extent influenced in its course by the physiologic effects of such adaptations.

Every syndrome has multiple causes in the sense that a number of conditions must be met before it can appear. Some of these necessary conditions are arbitrarily defined as such. The pneumococcus is, by definition, a necessary condition to the appearance of pneumococcal pneumonia, even though other bacteria can be involved in syndromes very much like pneumococcal pneumonia. Many factors, in addition to the presence of the pneumococcus, determine the other conditions necessary to the appearance of the pneumonia. Physiologic changes brought about during adaptations to life situations—probably affecting bronchial and pulmonary function, antibacterial defense mechanisms, and perhaps many other aspects of the host—seem to be among the factors helping to determine the occurrence of an episode of pneumococcal pneumonia.

The only illnesses in which a disturbance of the adaptation of the individual to his social environment is, by definition, a necessary condition, lie in that category which we have defined as disturbances of mood, thought and behavior—"sociopathic" or "psychopathic" behavior and perhaps some of the psychoneuroses and psychoses. The physiologic effects of adaptive efforts, successful or unsuccessful, influence the great majority of syndromes of all sorts, some to a great degree and some very little, and have a role in determining the conditions under which they will appear; but they are not by definition a necessary condition in themselves. Granted that a large proportion of the exacerbations of peptic ulcer appear primarily as a part of a response to a life situation, nevertheless such exacerbations may also be brought about by extensive burns or by the administration of corticosteroids. Granted likewise that the conditions necessary for the appearance of a fibrosarcoma in a man are largely independent of his relation to the society in which he lives, nevertheless there is no theoretic reason why his hormonal response to a profound disturbance of this relation might not affect the rate of growth of his tumor. Nor is there any inevitable connection between emotions and bodily disease, even when the relation of the subject to his social environment is highly pertinent to the course of the disease. Adaptive reactions, integrated at high levels of brain function, and influencing bodily processes to a major degree, may not be associated with any outward evidence of emotional or behavioral disturbance. It has been observed consistently during these studies that bodily illnesses and disturbances of mood, thought, and behavior do often occur together, but

that there appears to be no causal connection between them; it seems rather that both are a part of the response of the man to his total milieu, internal as well as external, at a given time.

The evidence indicates that the reaction of a man to his life situation has an influence upon all forms of illness, and that it plays a role of significance in at least one third of all episodes of disease, regardless of their nature or location, their cause or their severity. Ultimately medicine will have to take account of this in the treatment of illness. It is very probable that an increasing proportion of the therapeutic effort will have to be directed at the patient's relation to his environment if we wish to make any significant improvement in his health. In view of the complexities involved in dealing with human relationships, human attitudes and human behavior, and the ineffectiveness of our present methods of dealing with these, it is also very probable that these efforts will be difficult, time-consuming and not, at first, highly rewarding. The problem stands before us as a stern challenge to medicine, and not as an easy opportunity.

SUMMARIO IN INTERLINGUA

Le presente reporto se basa super sex annos de investigationes del natura e del distribution del maladies de omne typos que occurreva inter le membros de cinque gruppos del population e del relationes inter le configuration del maladies de individuos, lor experientias vital, e lor milieu social e physic. Esseva investigate (1) 1297 obreras american, (2) 1527 qualificate obreros american, (3) 100 chinese studentes universitari e personas professional, (4) 75 refugiatos hungare, e (5) 130 recente diplomatos de collegio american. Le investigation consisteva del scrutiny o effectuation de (1) le complete disponibile documentation sanitari, (2) historias medical e examines medical, (3) interviews psychiatric, (4) observationes sociologic, e (5) tests psychologic.

In omne gruppo individual, le subjectos con le plus grande numero de episodios de maladia per unitate de tempore (inter le etates de 12 e 45 annos) exhibiva un plus grande numero de syndromes clinic (major e minor) que concerneva un plus grande numero de systemas organic e representava un plus grande numero de categorias etiologic.

In omne gruppo individual, le subjectos plus frequentemente malade differeva ab le subjectos minus frequentemente malade in lor bases genetic, in lor tractos characterologic, e in lor maniera de reguardar e evaluar lor experientias vital e lor milieu social, sed le duo gruppos non differeva grandemente in le factos real de lor experientias e de lor milieu.

Circa un tertio del membros de omne gruppo individual habeva experientiate periodos de un a plure annos de durantia quando illes habeva habite un augmentate numero de maladies de varie formas. Un grande numero de iste "cumulos de maladies" coincideva con periodos de adaptation a nove e exigente experientias vital.

Le gruppos differeva le unes ab le alteres tanto in le natura como etiam in le incidentia del maladies experientiate per lor membros. Iste facto pote esser interpretate como resultado de lor effortio de adaptar se a lor milieu social e etiam como effecto de lor milieu physic.

Le datos indica que il existe differentias inter le homines in lor susceptibilitate general de contraher maladies. Le datos suggere que le processos del adaptation al milieu social e del adaptation a experientias vital individual exerce un importante influenza super le occurrentia de omne typos de maladia.

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